

Application No. 10/722,929  
Attorney Docket No: 25226A

Remarks

Support for the above-requested amendments to claim 1 is found at least in paragraphs [0009] - [0010], [0020], Examples 1 and 2, and in original claims 9 and 15. Claim 9 has been amended to change the phraseology to further describe the nano-clays claimed in claim 1. Support for new claim 21 is found at least in paragraphs [0008] and [0011] and Examples 3 and 4. New claims 22 and 23 are supported at least by paragraph [0011] and Example 4. New claim 24 is supported at least by paragraphs [0008], [0010], and original claim 15. Claims 3 and 6 have been amended to correct inadvertent typographical errors. At least claims 3, 6, and 9 were not amended for any reason related to patentability. Claims 18 – 20 have been canceled without prejudice. No question of new matter arises and entry of the amendments and new claims is respectfully requested.

Claims 1 – 16 and 21 – 24 are before the Examiner for consideration.

Formal Matter

As shown above, Applicants have added new claims 21 – 24 by amendment. Because claims 17 – 20 have been canceled, the total number of claims Applicants are submitting for examination is not greater than the total number of claims previously presented and paid for. Therefore, Applicants respectfully submit that no additional filing fees are required for newly added claims 21 – 24. In addition, Applicants respectfully submit that there are no fees required for new independent claims 21 and 24 because the total number of independent claims present in the application does not exceed three. Furthermore, because support for newly added claims 21 - 24 is found throughout the specification, as identified in the opening paragraph of the Remarks, Applicants respectfully submit that these newly added claims do not contain any new matter.

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**Restriction Requirement**

The Examiner has required an election in the above-identified application as follows:

Group I, Claims 1 – 17, drawn to a method of making a rigid foam; and

Group II, Claims 18 – 20, drawn to a rigid foam.

The Examiner indicates that during a telephone conversation with Maria C. Gasaway on May 18, 2005, a provisional election was made with traverse to prosecute the invention of Group I, claims 1 - 17. Additionally the Examiner notes that claims 18 – 20 have been withdrawn from further consideration as being drawn to a non-elected invention.

In response to this restriction requirement, Applicants hereby affirm the election of Group I, claims 1 –17.

**Rejections under 35 U.S.C. §102(e)**

(1) Claims 1 – 17 have been rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,908,950 to Loh *et al.* In particular, the Examiner asserts that Loh *et al.* teach preparing a polymer melt, incorporating nano-particles into the melt, incorporating a blowing agent into the melt, extruding the polymer melt, and cooling the foamed product.

(2) Claims 1 – 17 have been rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,759,446 to Lee *et al.* In particular, the Examiner asserts that Lee *et al.* teach preparing a polymer melt incorporating nano-particles into the melt, incorporating a blowing agent into the melt, extruding the polymer melt, and cooling the foamed product.

In response to these rejections, Applicants respectfully submit that neither Loh *et al.* nor Lee *et al.* teach or suggest a method of manufacturing a rigid foam that includes incorporating at least one nano-particle that is either a nano-clay, calcium carbonate, an

intercalated graphite, or an expanded graphite into a polymer melt, incorporating a blowing agent into the polymer melt under a first pressure and at a first temperature, extruding the polymer melt under a second pressure and at a second temperature sufficient to allow the polymer melt to expand and form a foam, and cooling the foam to form a foam product that has an average cell size greater than about 60  $\mu\text{m}$  as claimed in amended claim 1.

Loh *et al.* teach rigid foam insulating products (*e.g.*, foamed polymeric boards) that contain asphalt as an infrared attenuating agent to improve thermal insulation and to retain other properties. (*See, e.g.*, column 1, lines 5 – 7, column 2, lines 21 – 25, and column 3, line 66 – column 4, line 2). The foamed products are prepared by a process that includes: (1) forming a foammable mixture that contains a polymer, an asphalt, a blowing agent, and other process additives (*e.g.*, a nucleation agent and flame retardant chemicals), and (2) foaming the mixture in a region of reduced pressure to form a foamed product. (*See, e.g.*, column 4, lines 45 – 54). In preferred embodiments, the polymer foam is prepared by twin-screw extruders (low shear) with a flat die and plate shaper or by a single screw tandem extruder (high shear) with a radial die and slinky shaper. (*See, e.g.*, column 6, lines 38 – 42). Asphalt is added into the extruder along with the polymer, a blowing agent, and/or a nucleation agent, a fire retardant, and an infrared attenuating agent by multi-feeders. (*See, e.g.*, column 6, lines 42 – 45). The polymer is preferably an alkenyl aromatic polymer material such as polystyrene. (*See, e.g.*, column 4, lines 16 – 17 and 29 – 30). The blowing agent may be any suitable blowing agent, including inorganic blowing agents, organic blowing agents, and chemical blowing agents. (*See, e.g.*, column 4, lines 58 – 61). The asphalt can be uniformly blended throughout the polymer in the extruding process. (*See, e.g.*, column 6, lines 45 – 47).

However, there is no teaching within the four corners of Loh *et al.* of forming a rigid foam product by incorporating at least one nano-particle that is either a nano-clay, calcium

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carbonate, an intercalated graphite, or an expanded graphite into a polymer melt as claimed in amended claim 1. In order for a reference to be anticipatory, each and every element of the claimed invention must be found within the four corners of the cited reference. Because Loh *et al.* do not teach adding a nano-clay, calcium carbonate, an intercalated graphite, or an expanded graphite into a polymer melt as required by claim 1, Loh *et al.* is not an anticipatory reference. Therefore, Applicants submit that claim 1, and all claims dependent therefrom, are not anticipated by Loh *et al.*

Lee *et al.* teach a method of forming a polymeric nanocomposite foam that includes (1) providing a mixture having a polymer, an organophilic clay, and a blowing agent and (2) processing the mixture to cause a formation of cells. (*See, e.g.*, column 2, lines 30 – 35). Although any traditional blowing agent may be used, it is preferred that the blowing agent is a supercritical fluid, most preferably supercritical carbon dioxide. (*See, e.g.*, column 3, lines 25 – 29). By controlling the carbon dioxide content, the melt and die temperatures, and pressure drop rate, a microcellular foam is formed that has a very high cell density (*i.e.*,  $>10^9$  cells/cm<sup>3</sup>) and a small cell size (*i.e.*,  $< 5 \mu\text{m}$ ). (*See, e.g.*, Abstract). It is preferred that the average cell size is less than about 20  $\mu\text{m}$ . (*See, e.g.*, column 3, lines 31 – 33 and column 4, lines 24 - 27). There is no teaching within the four corners of Lee *et al.* of a method of making a foam product that has an average cell size greater than about 60  $\mu\text{m}$  as presently claimed in claim 1. Because Lee *et al.* do not teach or suggest a method of making a rigid polymer foam having an average cell size greater than approximately 60  $\mu\text{m}$  as claimed in independent claim 1, Applicants submit that claim 1, and all claims dependent therefrom, are not anticipated by Lee *et al.*

With respect to newly added claims 21 – 23, Applicants submit that neither Loh *et al.* nor Lee *et al.* teach or suggest a method of manufacturing a rigid foam that includes the steps

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of (1) incorporating acicular nano-particles into a polymer melt, (2) adding a blowing agent to the polymer melt under a first pressure and at a first temperature, (3) extruding the polymer melt under a second pressure and at a second temperature sufficient to allow the polymer melt to expand and form a foam, and (4) cooling the foam to form a foam product. It is respectfully submitted that neither Loh *et al.* nor Lee *et al.* teach or suggest incorporating acicular nano-particles into a polymer melt. Thus, Applicants submit that new independent claim 21, and all claims dependent therefrom, are non-anticipatory, non-obvious, and patentable.

With respect to newly added claim 24, Applicants submit that neither Loh *et al.* nor Lee *et al.* teach or suggest a method of manufacturing a rigid foam that includes the steps of (1) incorporating nano-particles into a polymer melt, (2) adding a blowing agent to the polymer melt under a first pressure and at a first temperature, (3) extruding the polymer melt under a second pressure and at a second temperature sufficient to allow the polymer melt to expand and form a foam, and (4) cooling the foam to form a foam product that has an average cell size between about 60 and about 120  $\mu\text{m}$ . Applicants respectfully submit that neither Loh *et al.* nor Lee *et al.* teach or suggest incorporating acicular nano-particles into a polymer melt. Thus, Applicants submit that new independent claim 24 is non-anticipatory, non-obvious, and patentable.

In view of the above, Applicants submit that the present invention is not anticipated by, or obvious over, either Loh *et al.* or Lee *et al.* and respectfully request reconsideration and withdrawal of these rejections.

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Conclusion

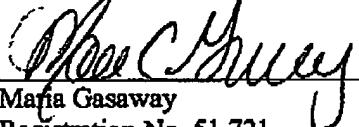
In light of the above, Applicants believe that this application is now in condition for allowance and therefore request favorable consideration.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

If necessary, the Commissioner is hereby authorized to charge payment or credit any overpayment to Deposit Account No. 50-0568 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

Date: 10/25/05

  
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